

# LARVAE AND PUPAE OF *LECTRIDES VARIANS* MOSELY AND *LEPTORUSSA DARLINGTONI* (BANKS), (TRICHOPTERA: LEPTOCERIDAE)

by J. E. JACKSON\*

## Summary

JACKSON, J. E. (1985) Larvae and pupae of *Lectrides varians* Mosely and *Leptorussa darlingtoni* (Banks), (Trichoptera: Leptoceridae). *Trans. R. Soc. S. Aust.* **109**(3), 83-95, 29 November, 1985.

Final instar larvae and pupae of two species of Leptoceridae, *Lectrides varians* Mosely and *Leptorussa darlingtoni* (Banks), are described and figured.

KEY WORDS: Trichoptera, Leptoceridae, larvae, pupae.

## Introduction

The taxonomy of the immatures of Australian Trichoptera is in an early stage of development compared with that of the northern hemisphere fauna, for which keys of larvae to genera and species have been developed (Hickin 1967, Lépneva 1964, Wiggins 1977). Identification of Australian larvae to family is possible using the key of Williams (1980) as revised by Drecktrah (1984), and a key to some free-living and net-spinning genera has been developed by Cartwright & Dean (1982). Few detailed descriptions of Australian larvae are available (examples are Riek (1968), Neboiss (1977b, 1979), and Drecktrah (1984)), and for many species the larvae are not known. No immatures of Australian Leptoceridae are adequately described, despite their dominance in the Australian fauna (Riek 1970).

The leptocerid genus *Leptorussa* Mosely is monotypic: *L. russata* Mosely is considered by Neboiss (1977a) to be conspecific with *L. darlingtoni*. The species is recorded from Queensland, New South Wales, Victoria, South Australia and Tasmania (Neboiss 1983); adults of both sexes are described by Mosely & Kimmins (1953) and Neboiss (1977a). *Lectrides* Mosely includes *L. varians* and the recently discovered *L. parilis* Neboiss, the larva of which is unknown; *L. varians* is recorded from South-east Queensland, Victoria and Tasmania (Neboiss 1983). Taxonomic descriptions of the previously undescribed final instar larvae and pupae of *Lectrides varians* Mosely and *Leptorussa darlingtoni* (Banks) were undertaken prior to a comparative study of the two species<sup>1</sup>.

## Methods

Identification of *Lectrides varians* and *Leptorussa darlingtoni* was confirmed by rearing larvae and pupae to adults.

Descriptions of final instar larvae are based on preserved specimens collected from a site near Heathfield, S. Aust., (139°39'E, 35°01'S); pupal descriptions are based on pupae reared from larvae in the laboratory, a few collected specimens, and pupal exuviae. Whole specimens were prepared for microscopic examination by maceration of soft parts in hot KOH (5%) for 10-15 minutes, rinsing in glacial acetic acid, and clearing in clove oil. Specimens were then dissected and prepared as temporary mounts in clove oil, or permanent preparations in Depex. Drawings were made from slides with the aid of a drawing tube on a Wild M20 compound microscope and a camera lucida on a Wild M3 stereomicroscope. Head capsule width of larvae was measured to the nearest 0.01 mm, at the level of the eyes, using an ocular micrometer. Morphological terminology of larvae follows that of Wiggins (1977).

Specimens are deposited in the Museum of Victoria, Melbourne.

## *Lectrides varians* Mosely

**Material examined:** 25 larvae, from near Heathfield, S. Aust., April 1984, 9 pupae from Heathfield, April 1984, and laboratory reared.

## Final instar larva

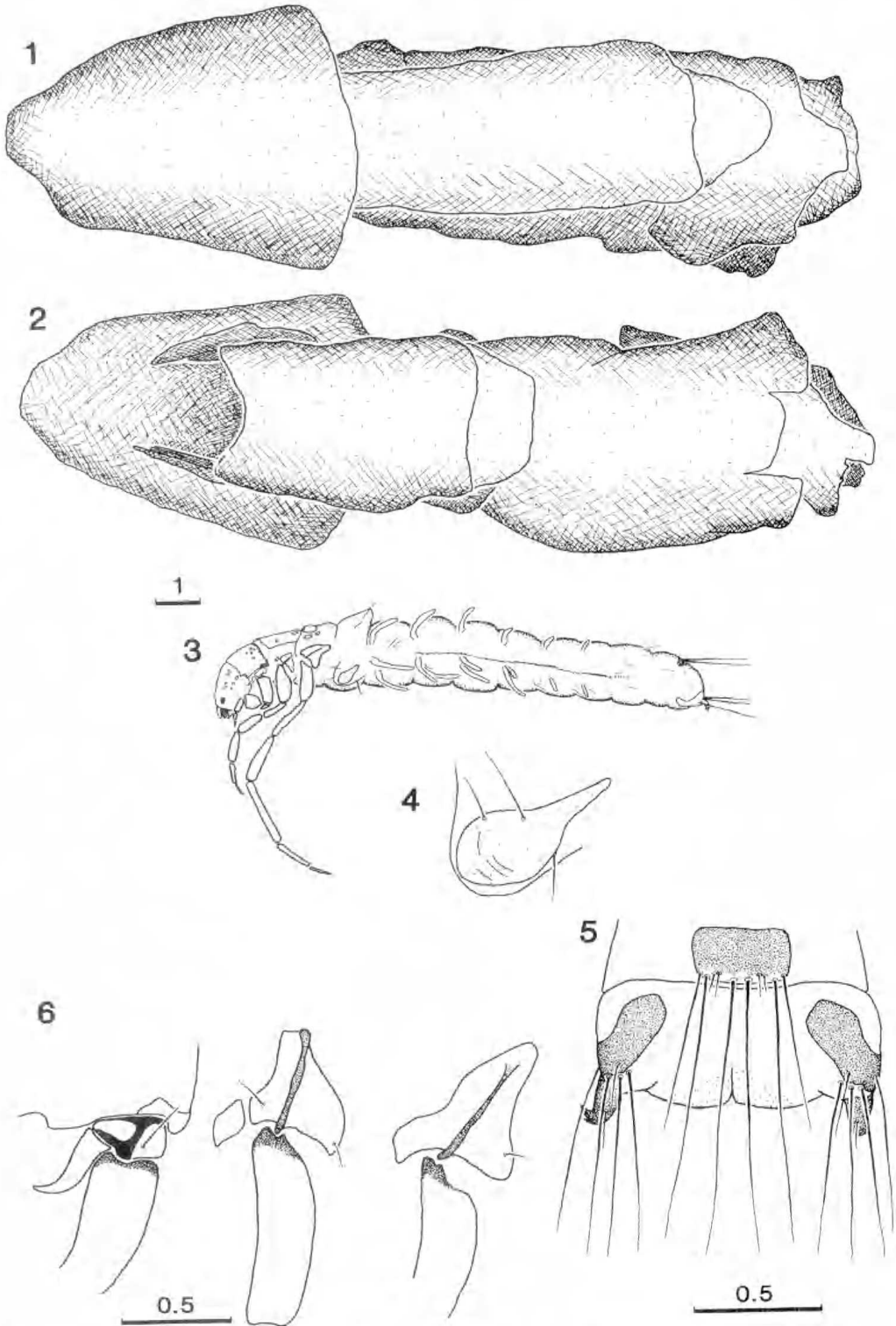
**Case** (Figs 1, 2). Constructed from roughly quadrate leaf fragments, overlapping in a dorsal and a ventral row; anteriorly, dorsal fragment projects further forward than ventral fragment, forming a hood; filaments of plant material fill between dorsal and ventral rows, and around the anterior opening.

**Larva** (Figs 3-19). Body length 11-13 mm; head capsule width 0.78-0.81 mm, length 1-1.13 mm. Sclerotized parts golden brown, with distinct paler

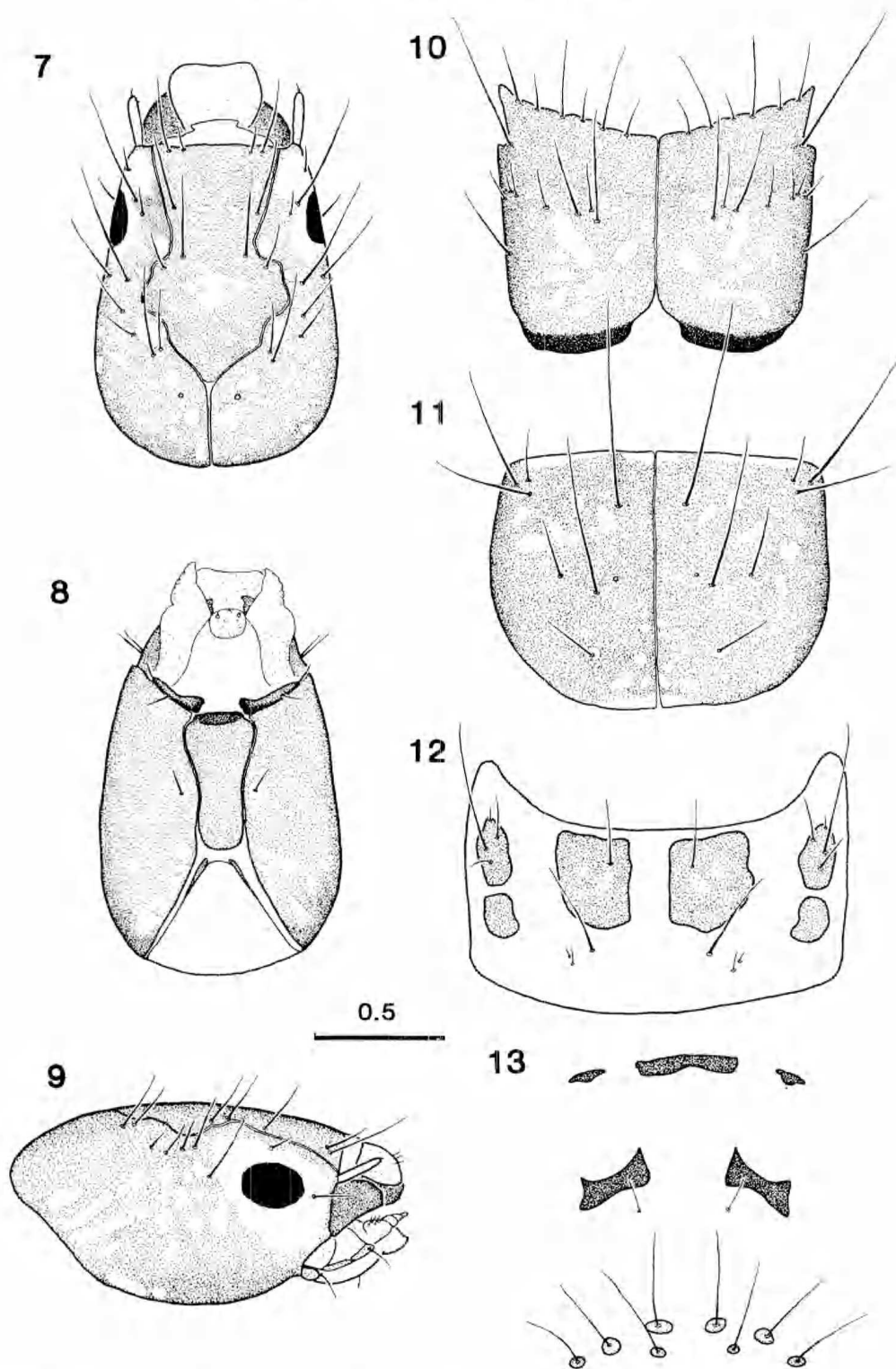
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Present address: 25 Austral Terrace, Malvern, S. Aust., 5061.

<sup>1</sup> Jackson, J. E. (1984). Taxonomy, biology and case function of *Lectrides varians* Mosely and *Leptorussa darlingtoni* (Banks) larvae (Trichoptera: Leptoceridae). Honours thesis, Department of Zoology, University of Adelaide. Unpubl.



Figs 1-6. *Lectrides varians* final instar larva: 1, 2, case, dorsal and ventral views; 3, larva, lateral view (most setae not shown); 4, left lateral hump, enlarged; 5, abdominal segment IX and anal legs, dorsal view; 6, thoracic pleurites. All scale lines in mm.



Figs 7-13. *Lectrideres varians* final instar larva: 7-9, head, dorsal, ventral and lateral views; 10-12, pro-, meso- and metanota, dorsal view; 13, thoracic sternites. All scale lines in mm.

markings on head and thorax, dark bands on legs. Head (Figs 7-9) with pale spots on parietals, occipital margins and posterior half of genae; ovate in dorsal view, width about 2/3 length. Antennae about length of right mandible, short seta apically. Frontoclypeus strongly constricted medially, expanded posteriorly to slightly greater width than at anterior margin; 2 shallow concavities on posterolateral margins; the resulting irregularities emphasized by adjacent pale spots on parietals. Eyes situated dorsolaterally, just anterior to frontoclypeal constriction, surrounded by pale area.

Labrum (Fig. 15) subovate, anterior margin with shallow indentation, dense fringe of short hair in indentation, ventral brushes of long hair anterolaterally; median paired anterior setae short, pale, in front of three pairs of setae in a transverse row. Mandibles (Fig. 16) with rounded teeth distally on cutting edges, six on left, five on right; left mandible slightly longer than right, inner surface deeply excavated, with two brushes; right mandible only slightly excavated, without brushes. Maxillo-labium (Fig. 14): cardo digitiform with proximal end broadly truncated, bearing one medial and one distal seta; stipes incised medially on inner edge, a lateral and shorter medial seta on distal margin; maxillary palp four segmented, galea lobate, with three finger-like sensillae apically; submental sclerites absent, two long submental setae present; labial palps conspicuous, cylindrical. Ventral apotome (Fig. 8) oblong, about 1/2 length of parietals, width about 1/3 length, broadest anteriorly, tapered to almost 1/2 width posteriorly.

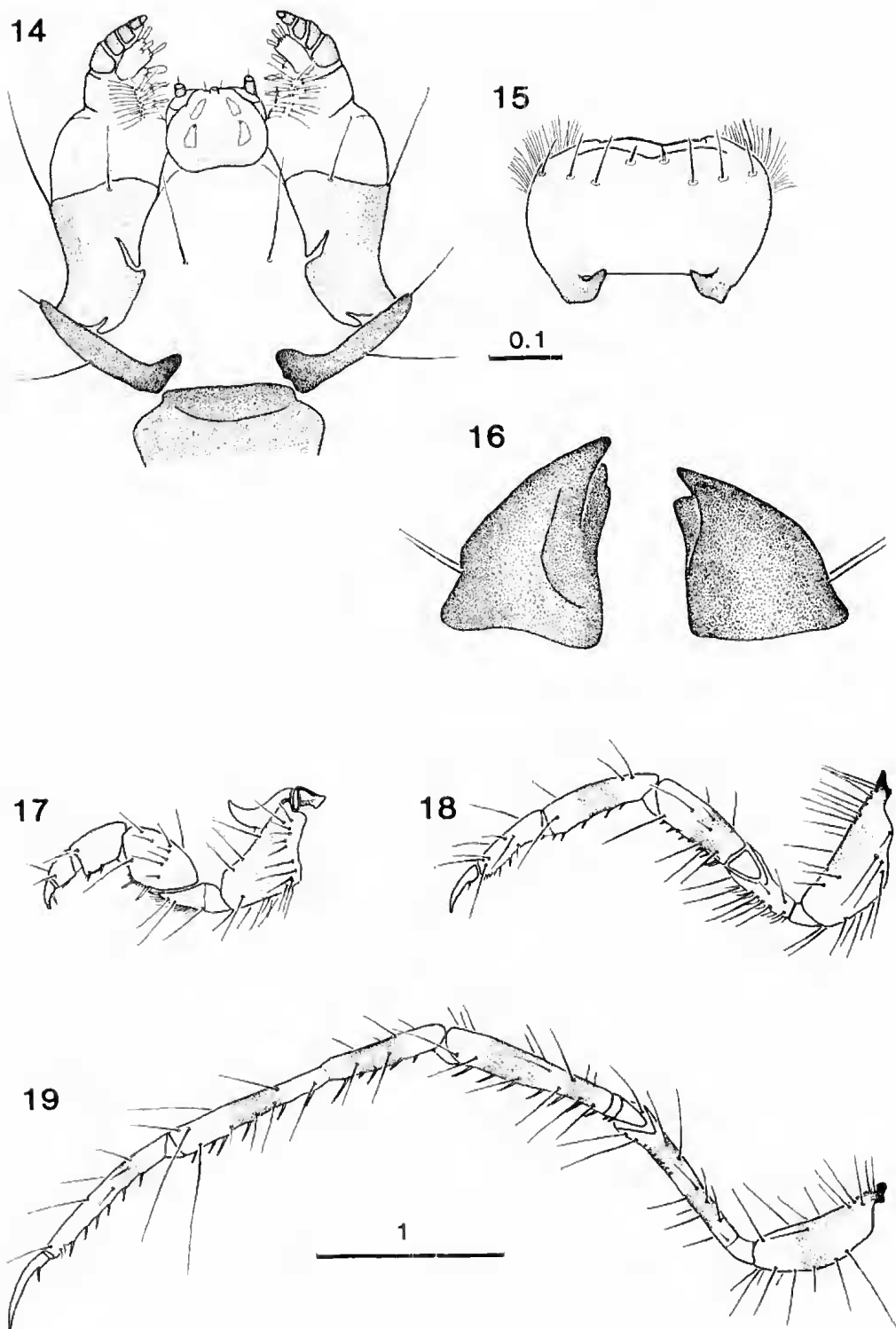
Pronotum (Fig. 10). Anterolateral angles projected forward, acute, slightly upturned; anterior margin concave, shallowly crenate with six pairs of marginal setae arising in constrictions; transverse row of setae just anterior to middle of notum; posterior margin heavily sclerotized. Mesonotum (Fig. 11) rounded posterolaterally, setae sparse, three setae grouped in each anterolateral angle. Metanotum (Fig. 12) only partially sclerotized; 2 subquadrate sclerites anteromedially and smaller paired sclerites laterally; a single seta in each medial sclerite, three in anterolateral sclerites, one long and two very short setae posterior to each medial sclerite. Prosternum (Fig. 13) with dark brown sclerotized bar on posterior margin, smaller bar on each side; pair of mesosternal sclerites; metasternum with 8-10 setae in two curved transverse rows, most arising from small round sclerites.

Legs (Figs 17-19). Forelegs (Fig. 17) short, segments decreasing in size distally; coxa and femur subtriangular, coxa with band of setae offset from posterolateral margin. Fore-trochanter horn-shaped, upturned apically, one seta on ventral

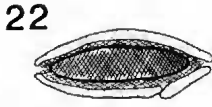
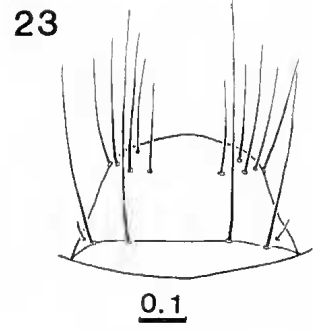
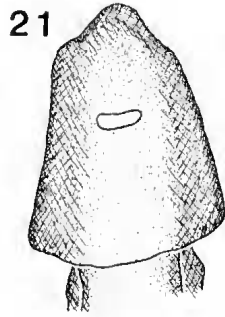
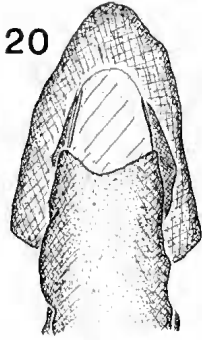
margin. Trochanter with short spur on distal angle, distally a ventral brush of short pale setae. Femur length about 2x width; row of short pale setae ventrally. Tibia cylindrical; anteriorly three dark spurs; ventrally four; row of short pale setae ventrally. Tarsus with three spurs ventrally; tarsal claw stout, curved, slightly shorter than tarsus, basal spur almost length of claw. Midleg (Fig. 18) about 1 1/2 x length of foreleg, segments subequal. Trochanter with ventral brush. Femur bears seven dark spurs ventrally and comb of minute spines basally on distal segment. Tibia with seven spurs on anterior face, five ventrally. Tarsus with four spurs, row of pale setae distally; tarsal claw stout, slightly curved, basal spur short. Hindleg (Fig. 19) about 2x length of midleg. Trochanter with row of seven small dark spurs on distal 1/3, femur with seven dark spurs ventrally, two small spurs near division. Tibia almost 2x length of other segments, divided subequally, basal segment with five spurs, distal with eight. Tarsus with six dark spurs ventrally; tarsal claw robust, basal spur short.

Abdomen (Fig. 3) dorsoventrally flattened; lateral fringe dark, on segment VIII reduced to only a few hairs; segment VIII with lateral row of spicules on anterior half; hairs on segments II-IX: II, four dorsolateral; III-VII, two ventrolateral; VIII, six dorsal two ventrolateral; IX, two dorsolateral. Lateral humps (Fig. 4) each with clavate sclerite and three setae; dorsal hump conical, two pairs of fine setae. Tergite IX (Fig. 5) rectangular; three pairs of marginal setae posteriorly, each outer one shorter than others, two pairs of very short setae offset from margin. Lateral sclerites of anal legs uniformly brown. Gills single, finger-like, in following positions: segment I, posterior dorsal; segments II-VI, anterior dorsal, lateral and ventral; segment VII, anterior dorsal and ventral (presence variable).

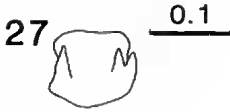
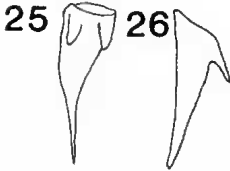
*Pupa* (Figs 20-34). Length 11.5-12.5 mm. Legs without apical hooks or claws, fore- and midlegs with dense hair fringes. Antennal bases each with seven erect black setae. Labrum (Fig. 23) with lateral margins straight, converging anteriorly, anterior margin rounded; five pairs of setae anterolaterally. Mandibles (Figs 28-31) broad-based, slender apically; inner margin roughly serrate, with or without a well developed projection; paired setae on outer surface near base. Terminalia of abdomen (Figs 32-34) with two small dorsal processes, each bearing four strong anterolaterally directed setae; male (Fig. 33) with pair of fleshy clasper-shaped ventral protuberances with bulbous process between bases; female (Fig. 34) with ventral hump. Anal processes rod-like, longer than 9th abdominal segment, apices curved dorsad and pointed, 2-3 short setae arising from inner margin subapically,



Figs 14-19. *Lectrides varians* final instar larva: 14, maxillo-labium, showing association with head capsule, ventral view; 15, labrum, dorsal; 16, mandibles, dorsal; 17-19, fore-, mid- and hindlegs, left. All scale lines in mm.



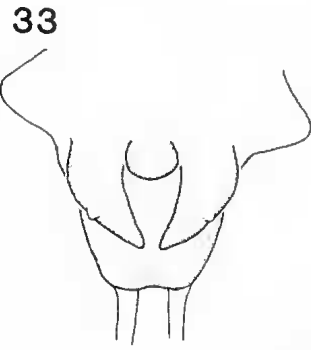
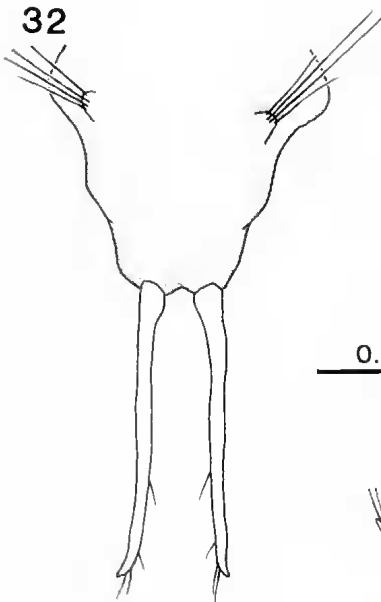
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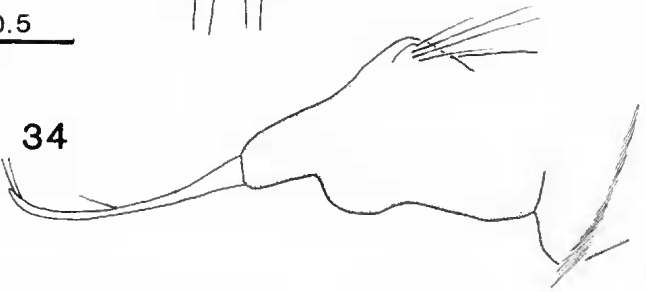
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a 4th about 2/3 from basal end. Posterior angles of abdominal segment I bear transverse oblong plates with thickened ridges (Fig. 24); segments III-VI bear elongate anterior hookplates (Figs 25, 26) with 2-3 prominent posteriorly-directed hooks; segment V with rectangular posterior hookplates (Fig. 27) bearing three anteriorly-directed hooks. Segments II-VII with paired T-shaped sclerites dorsally and ventrally; proximal bar of T reduced in ventral sclerites.

**Pupal Case** (Figs 20-22). Larval case modified by closure anteriorly with oblique silk membrane, with which attached to substrate; transverse vent in anterior dorsal plate, through which larval sclerites ejected; posterior closure perpendicular leaf fragment; orientation of pupa reverse of larval orientation.

*Leptorussa darlingtoni* (Banks)

**Material examined:** 20 larvae, from near Heathfield, S. Aust., April, May 1984, six pupae laboratory reared.

*Final instar larva*

**Case** (Fig. 35). Length 8-12 mm, constructed of sandgrains, cylindrical, tapering posteriorly, slightly curved; anterior margin usually straight or with small dorsal process; posterior membrane absent.

**Larva** (Figs 36-55). Body length 6-8 mm; head capsule width 0.54 mm, length 0.73-0.77 mm. Head and thorax dark brown; distinct pale markings on head, usually pale cross on frontoclypeus, thorax mottled. Legs golden-brown with indistinct darker bands.

**Head** (Figs 43-45) ovate in dorsal view, width about 2/3 length. Antennae about length of right mandible, short seta apically. Frontoclypeus sub-pandurate. Eyes situated dorsolaterally, just anterior to fronto-clypeal constriction, surrounded by pale area.

**Labrum** (Fig. 52) subovate, anterior margin with four setae in shallow indentation, one long seta arising from each anterolateral margin, medially three pairs of setae in transverse row. Mandibles (Figs 54, 55) with prominent teeth distally, six on left, five on right; left slightly longer than right, inner surface deeply excavated and bearing two small brushes; right only slightly excavated, without brushes. Maxillo-labium (Fig. 53): cardo blunt proximally, attenuated laterally, bears 1 medial and one distal seta; stipes with one lateral and one

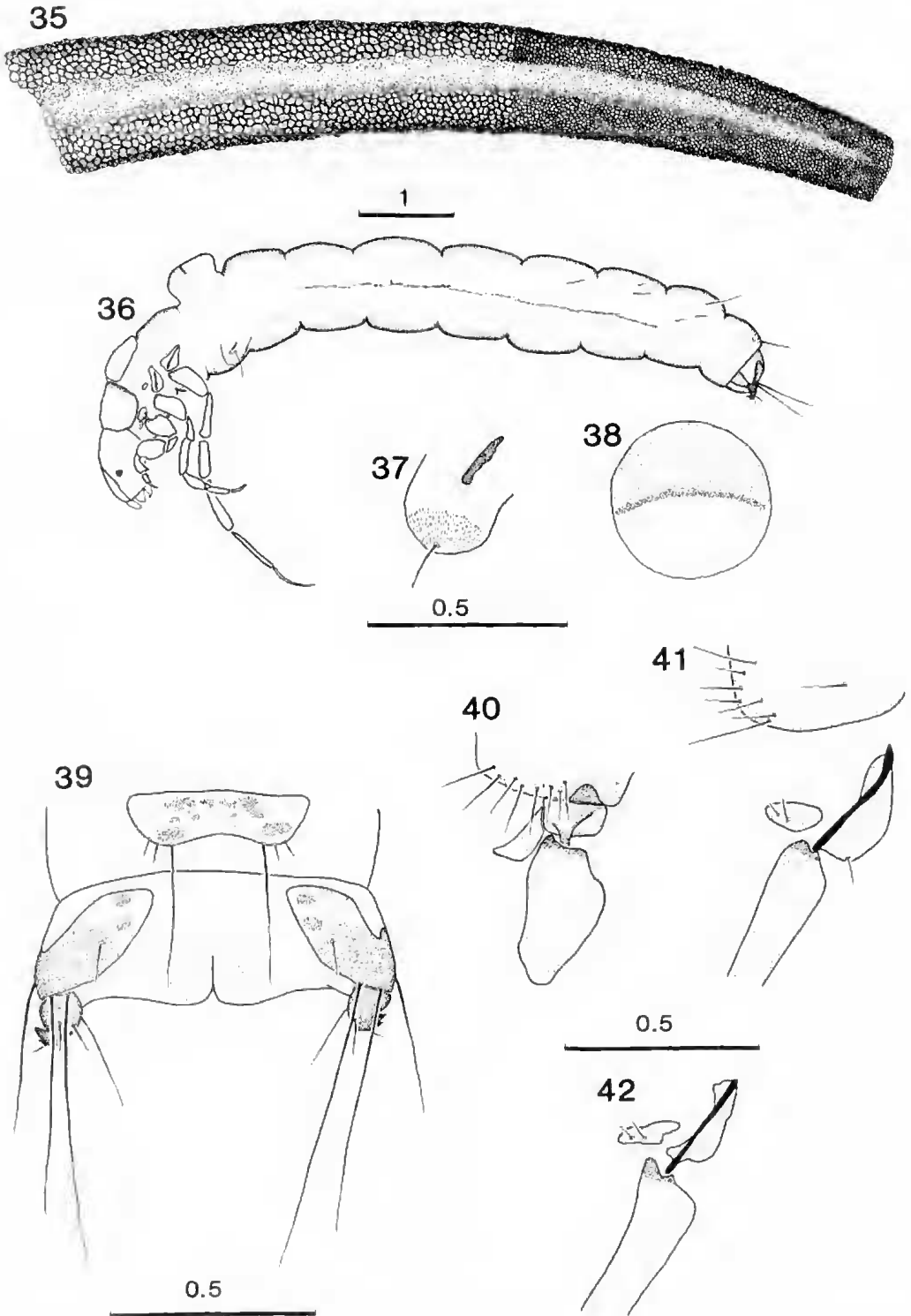
shorter medial seta on distal margin; maxillary palps three segmented, galea lobate, a single sensilla apically; submental sclerites quadrate, two long submental setae; palpigers Z-shaped, very narrow. Ventral apotome (Fig. 44) rectangular, width about 2/3 length, slightly narrower anteriorly.

**Pronotum** (Fig. 46) rectangular; anterior margin pale, with 6-7 pairs of regularly spaced setae; lateral margins (Fig. 40) with row of about seven setae; posterior margin heavily sclerotized. Mesonotum (Fig. 46) rounded posterolaterally, four pairs of scattered setae dorsally, about seven setae grouped in each anterolateral angle. Metanotum (Fig. 46) mostly membranous; medially two small irregular sclerites, bearing one short seta on anteroproximal angle, laterally three long setae. Prosternal sclerite absent, two small dark mesosternites (Figs 47, 48), metasternum with 4-5 pairs of setae.

**Legs** (Figs 49-51). Anterior face of coxae much more densely setose than posterior face, other segments with few setae. Foreleg (Fig. 49) short and robust. Fore-trochantin (Fig. 40) truncated distally, anterodorsal angle produced forward slightly, two setae on anterior margin. Trochanter with two pale spurs near distal angle, brush of short pale setae distally. Femur width about 2/3 length, comb of small pale spurs ventrally. Tibia dilated distally, four spurs on ventral margin. Tarsal diameter about 1/2 that of tibia at joint, six spurs ventrally; tarsal claw as long as tarsus, basal spur about 1/2 length. Midleg (Fig. 50) almost 2x length of foreleg, less robust, segments (except for short trochanter) decreasing in size distally. Distal segment of trochanter with ventral brush of pale setae. Femur bears comb of small pale spurs near base of distal segment. Tibia curved basally, spur arising 2/3 from basal end. Tarsus with ventral row of small pale spurs on distal 2/3. Hind leg (Fig. 51) slender, about 2x length of midleg, segments subequal. Trochanter with comb of small pale spurs on distal 1/2 of posterior face. Femur with similar comb at base of distal segment. Tibia bears one spur near distal end. Tarsal spur arises medially; tarsal claw slender, curved slightly to a fine point, length about 2/3 length of tarsus, basal spur about 1/4 of length.

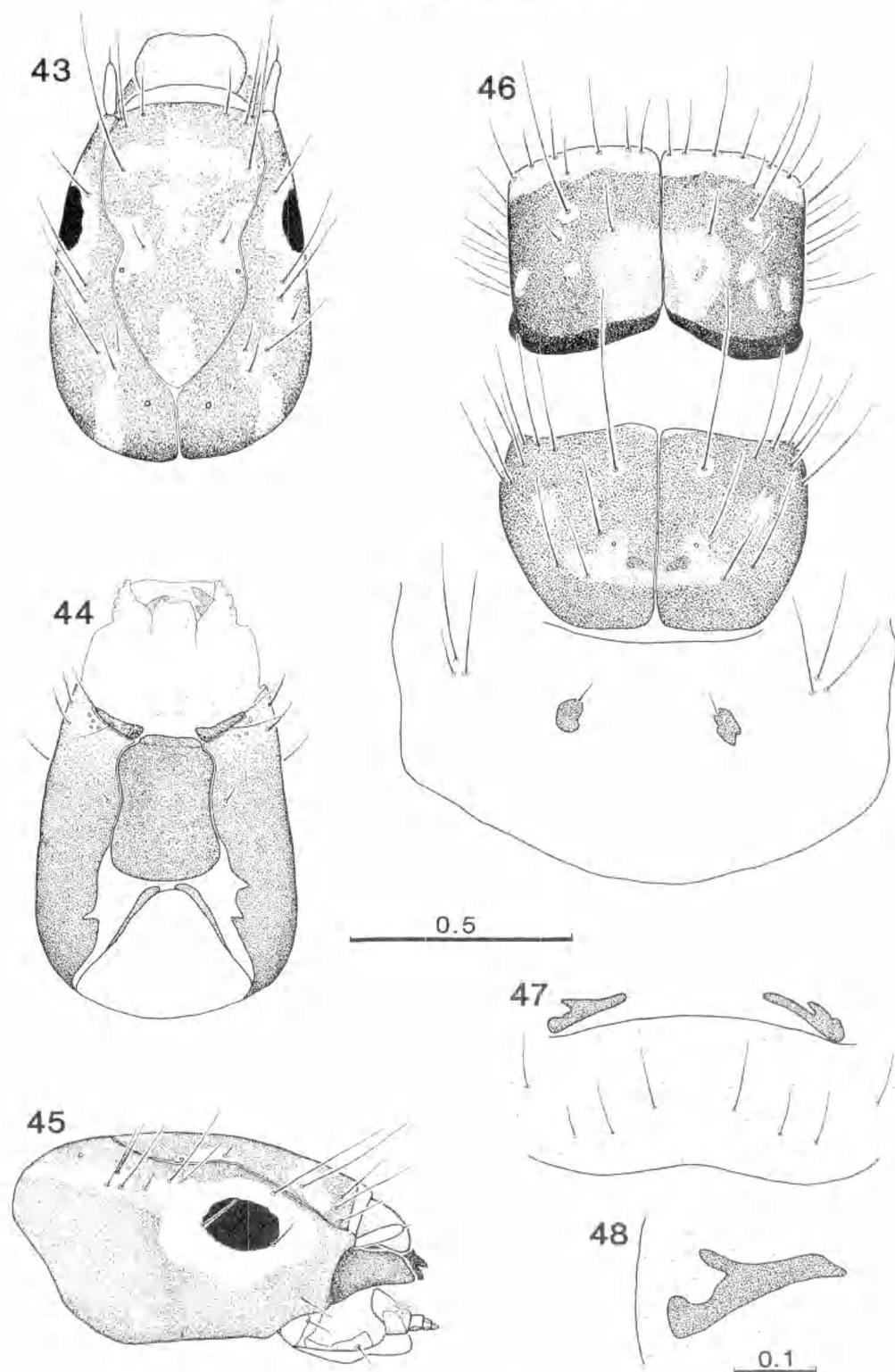
**Abdomen** (Fig. 36) creamy white, slightly dorso-ventrally flattened; lateral fringe short, fine; segment VIII with complete lateral row of spicules, lateral fringe absent; segments VI-VIII with dorsal hairs: VI-2, VII-4, VIII-6. Lateral bumps of segment I (Fig. 37) each with a sclerotized bar,

Figs 20-34. *Leotides varians* pupa. 20-22, case, anterior end in ventral and dorsal views, posterior closure; 23, labrum and ante-clypeus, dorsal; 24, right sclerotized plate of abdominal segment I; 25-27, right abdominal hookplates, anterior hookplate dorsal and lateral view, posterior hookplate dorsal view; 28-31, mandibles, left, without inner projection (28-29) and with inner projection (30-31); 32-34, terminalia of abdomen, dorsal, male ventral, and female lateral views. All scale lines in mm.

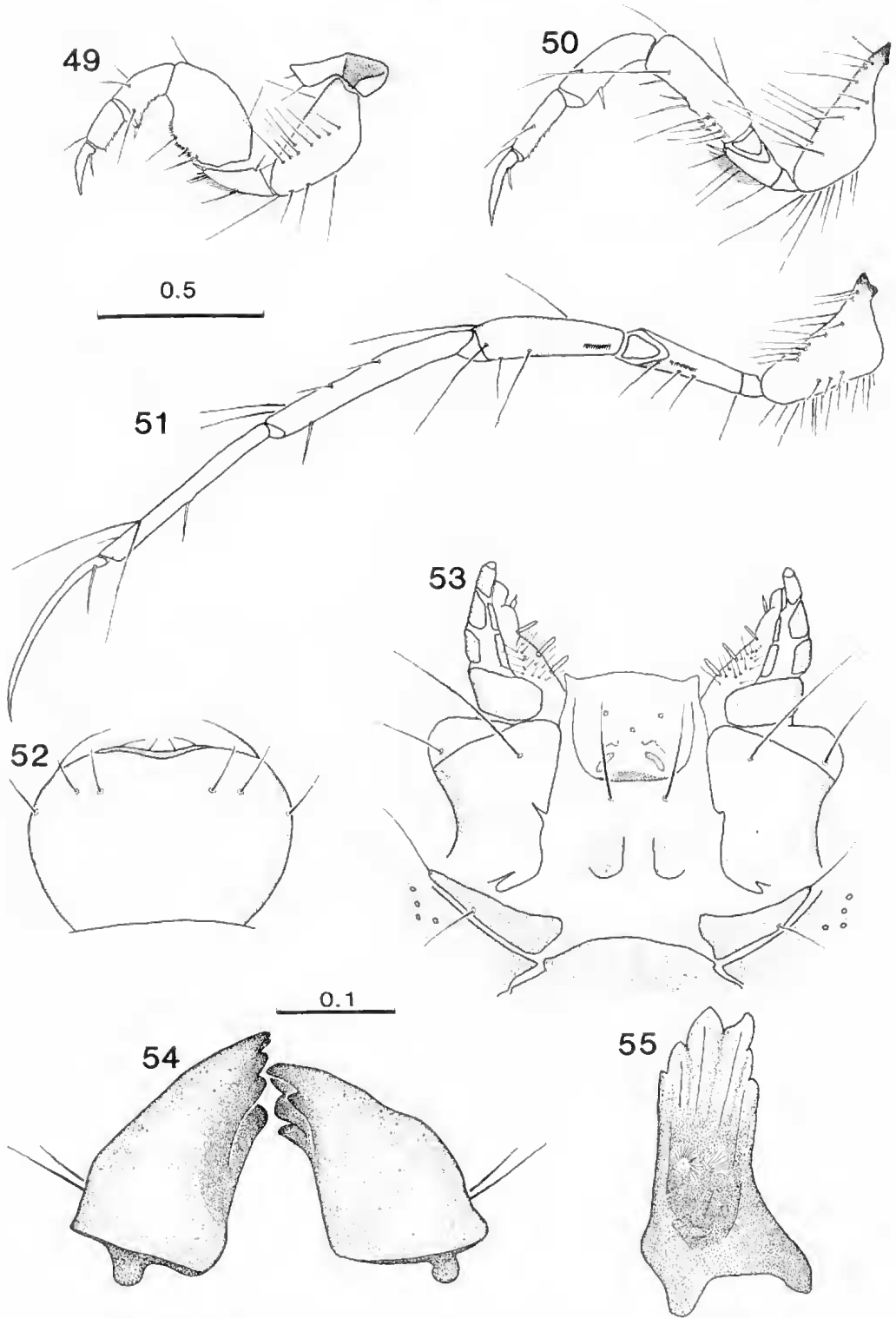


Figs 35–42. *Leptorussa darlingtoni* final instar larva: 35, case, lateral view; 36, larva, lateral view (gills not shown, most setae not shown); 37, left lateral hump, enlarged; 38, dorsal hump, dorsal view; 39, abdominal segment IX and anal legs, dorsal view; 40–42, pro-, meso- and metapleurites. All scale lines in mm.





Figs 43–48. *Leptorussa darlingtoni* final instar larva: 43–45, head, dorsal, ventral and lateral views; 46, thoracic nota, dorsal view; 47–48, meso- and metasterna, enlarged mesosternite. All scale lines in mm.



Figs 49-55. *Leptorussia darlingtoni* final instar larva: 49-51, fore-, mid- and hindlegs, left; 52, labrum, dorsal view; 53, maxillo-labium, showing association with head capsule, ventral view; 54, labrum, dorsal view; 55, mandible, interior face. All scale lines in mm.

TABLE 1. Arrangement of the gills of *L. darlingtoni*.

| Segment | Dorsal  | Lateral | Ventral                 |
|---------|---------|---------|-------------------------|
| I       | p 3br   | —       | p 2br                   |
| II      | a 3br   | a 3br   | a 3br                   |
| III     | a 3br   | a 1br   | a 3br                   |
| IV      | a 3br   | —       | a 3br                   |
| V       | a 2br   | —       | a 1/2br                 |
| VI      | a 1br   | —       | a 1/2br, present/absent |
| VII     | a 1/2br | —       | 1 br, present/absent    |

p=posterior, a=anterior, br=branched.

spinulose distally, a single medial seta; dorsal hump (Fig. 38) flat, with medial transverse sclerotized band, roughened with minute spicules anteriorly. Tergite IX (Fig. 39) width greater than 3x length, mostly unpigmented, with irregular dark spots; three setae laterally on posterior margin, medial setae much longer than others. Lateral sclerites of anal legs mostly unpigmented in anterior 1/2, few irregular spots. Anal claw with one small dorsal accessory hook. Gills filamentous, branched, arrangement as in Table 1.

**Pupa** (Figs 56–66). Length approximately 8 mm. Legs without apical hooks; fore- and midlegs with dense hair fringes, those of foreleg less dense. Antennae long, coiled several times around end of abdomen, antennal bases without setae. Labrum (Fig. 61) semicircular, two short setae anteriorly, five long setae on each lateral margin. Mandibles (Fig. 61) pincer-shaped, distal 1/2 of inner margin serrate, two setae on outer surface near base. Terminalia of abdomen (Figs 63–66) with two small dorsal processes, each bearing four strong antero-laterally directed setae; male pupa (Fig. 63) with three bulbous ventral protuberances. Anal processes (Fig. 66) rod-like, longer than 9th abdominal segment, apices curved dorsad and pointed; sparsely

covered with short pale hairs, two long setae arising from inner margins subapically, one short seta basal to these and fourth about 1/5 from basal end. Abdominal segment 1 bears pair of transverse oblong plates with thickened ridges; segments III–VI bear elongate anterior hookplates (Fig. 59) with 2–3 prominent posteriorly-directed hooks; segment V with rectangular posterior hookplates (Fig. 60) bearing 2–3 anteriorly-directed hooks. Segment II–VII with paired T-shaped sclerites dorsally and ventrally, proximal bar of T reduced in ventral sclerites.

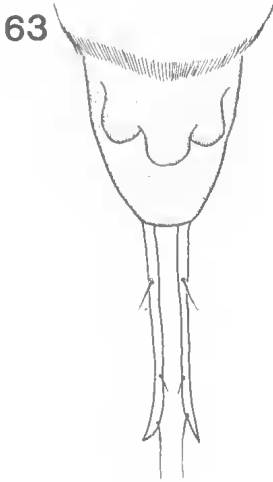
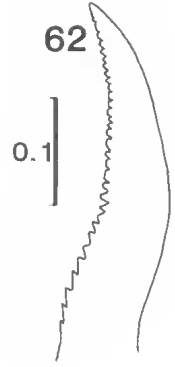
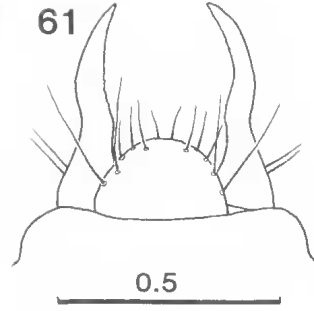
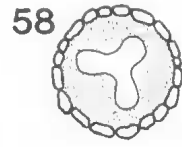
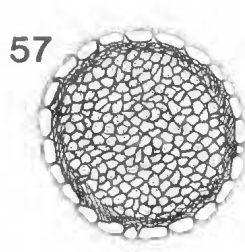
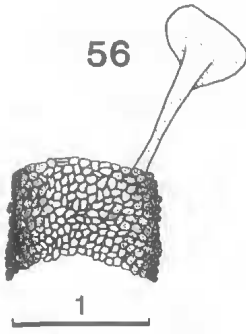
**Pupal Case** (Figs 56–58). Larval case modified by closure anteriorly with plate of sand grains bound with silk just in from rim (Fig. 57); posteriorly thick silk membrane, intact until larval ecdysis when trefoil-shaped vent is formed (Fig. 58); pupa in larval orientation, pharate adult escapes by opening anterior plate like trapdoor. Case attached to substrate with stalked disks (Fig. 56) anteriorly, or anteriorly and posteriorly.

#### Acknowledgments

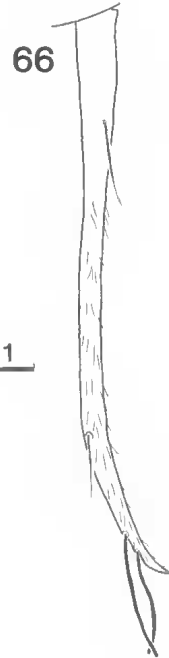
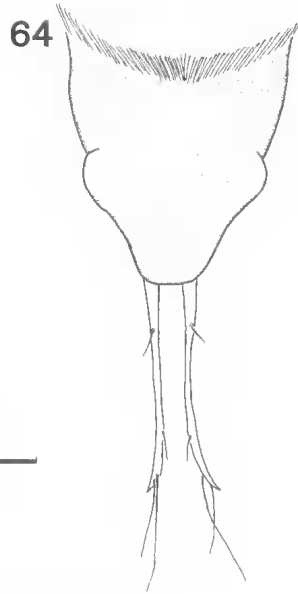
I am grateful to my Honours Supervisor, Alice Wells, and to Margaret Davies for helpful guidance in the preparation of this manuscript.

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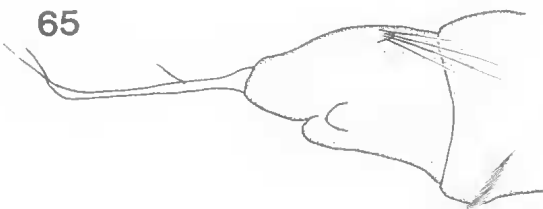
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Figs 56-66. *Leptorussa darlingtoni* pupa: 56-58, case, stalked-disk attachment, anterior and posterior closures; 59-60, anterior and posterior hookplates; 61, labrum and mandibles, dorsal view; 62, mandible, enlarged; 63-66, terminalia of abdomen, male ventral, female ventral, male lateral views, enlarged anal process. All scale lines in mm.